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WATER SUPPLY OUTLOOK FOR MONTANA

FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS

UNITED STATES DEPARTMENT of AGRICULTURE...SOIL CONSERVATION SERVICE, and MONTANA AGRICULTURAL EXPERIMENT STATION

Data included in this report were obtained by the agencies named above in cooperation with Federal, State, and private organizations listed on the inside back cover of this report.

SNOW PILLOW RECORDS 1968 WATER YEAR

TO RECIPIENTS OF WATER SUPPLY OUTLOOK REPORTS:

Most of the usable water in western states originates as mountain snowfall. This snowfall accumulates during the winter and spring, several months before the snow melts and appears as streamflow. Since the runoff from precipitation as snow is delayed, estimates of snowmelt runoff can be made well in advance of its occurrence. Streamflow forecasts published in this report are based principally on measurement of the water equivalent of the mountain snowpack.

Forecasts become more accurate as more of the data affecting runoff are measured. All forecasts assume that climatic factors during the remainder of the snow accumulation and melt season as they affect runoff will add to be an effective average. Early season forecasts are therefore subject to a greater change than those made on later dates.

The snow course measurement is obtained by sampling snow depth and water equivalent at surveyed and marked locations in mountain areas. A total of about ten samples are taken at each location. The average of these are reported as snow depth and water equivalent. These measurements are repeated in the same location near the same dates each year.

Snow surveys are made monthly or semi-monthly from January 1 through June 1 in most states. There are about 1400 snow courses in Western United States and in the Columbia Basin in British Columbia. In the near future, it is anticipated that automatic snow water equivalent sensing devices along with radio telemetry will provide a continuous record of snow water equivalent at key locations.

Detailed data on snow course and soil moisture measurements are presented in state and local reports. Other data or reservoir storage, summaries of precipitation, current streamflow, and soil moisture conditions at valley elevations are also included. The report for Western United States presents a broad picture of water supply outlook conditions, including selected streamflow forecasts, summary of snow accumulation to date, and storage in larger reservoirs.

Snow survey and soil moisture data for the period of record are published by the Soil Conservation Service by states about every five years. Data for the current year is summarized in a West-wide basic data summary and published about October 1 of each year.

PUBLISHED BY SOIL CONSERVATION SERVICE

D. A. WILLIAMS, Administrator

The Soil Conservation Service publishes reports following the principal snow survey dates from January 1 through June 1 in cooperation with state water administrators, agricultural experiment stations and others. Copies of the reports for Western United States and all state reports may be obtained from Soil Conservation Service, Western Regional Technical Service Center, Room 507, 701 N. W. Glisan, Portland, Oregon 97209.

Copies of state and local reports may also be obtained from state offices of the Soil Conservation Service in the following states:

STATE	ADDRESS
Alaska	P. O. Box "F", Palmer, Alaska 99645
Arizona	6029 Federal Building, Phoenix, Arizona 85205
Colorado (N. Mex.)	12417 Federal Building, Denver, Colorado 80202
Idaho	P. O. Box 38, Boise, Idaho 83707
Montana	P. O. Box 98, Bozeman, Montana 59715
Nevada	P. O. Box 4850, Reno Nevada 89505
Oregon	1218 S. W. Washington St., Portland, Oregon 97205
Utah	4012 Federal Building, Salt Lake City, Utah 84111
Washington	360 Federal Office Building, Spokane, Washington 99201
Wyoming	P. O. Box 340, Casper, Wyoming 82602

PUBLISHED BY OTHER AGENCIES

Water Supply Outlook reports prepared by other agencies include a report for California by the Water Supply Forecast and Snow Surveys Unit, California Department of Water Resources, P. O. Box 388, Sacramento, California 95802 --- and for British Columbia by the Department of Lands, Forests and Water Resources, Water Resources Service, Parliament Building, Victoria, British Columbia

WATER SUPPLY OUTLOOK FOR MONTANA

and FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS

Issued by

D.A. WILLIAMS

ADMINISTRATOR
SOIL CONSERVATION SERVICE
WASHINGTON, D.C.

Released by

A. B. LINFORD

STATE CONSERVATIONIST SOIL CONSERVATION SERVICE Bozeman, Montana

In Cooperation with

J. A. ASLESON

DIRECTOR

Montana Agricultural Experiment Station

Report prepared by

P. E. FARNES, Snow Survey Supervisor

SOIL CONSERVATION SERVICE P.O. Box 98 Bozeman, Montana 59715



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MONTANA FALL RESUME' October 1, 1968

April-September Streamflow

In the Columbia River drainage, streamflow was generally 80 to 90 percent average. Exceptions were the Blackfoot drainage with about 65 percent average flow and the Bitterroot drainage with about 95 percent average runoff.

Flow of the Missouri River at its headwaters was about 125 percent average. The Sun and Marias Rivers had flows in the 70 to 60 percent range. The Milk River produced a little less than average runoff. The Yellowstone drainage above Billings had 122 percent average runoff.

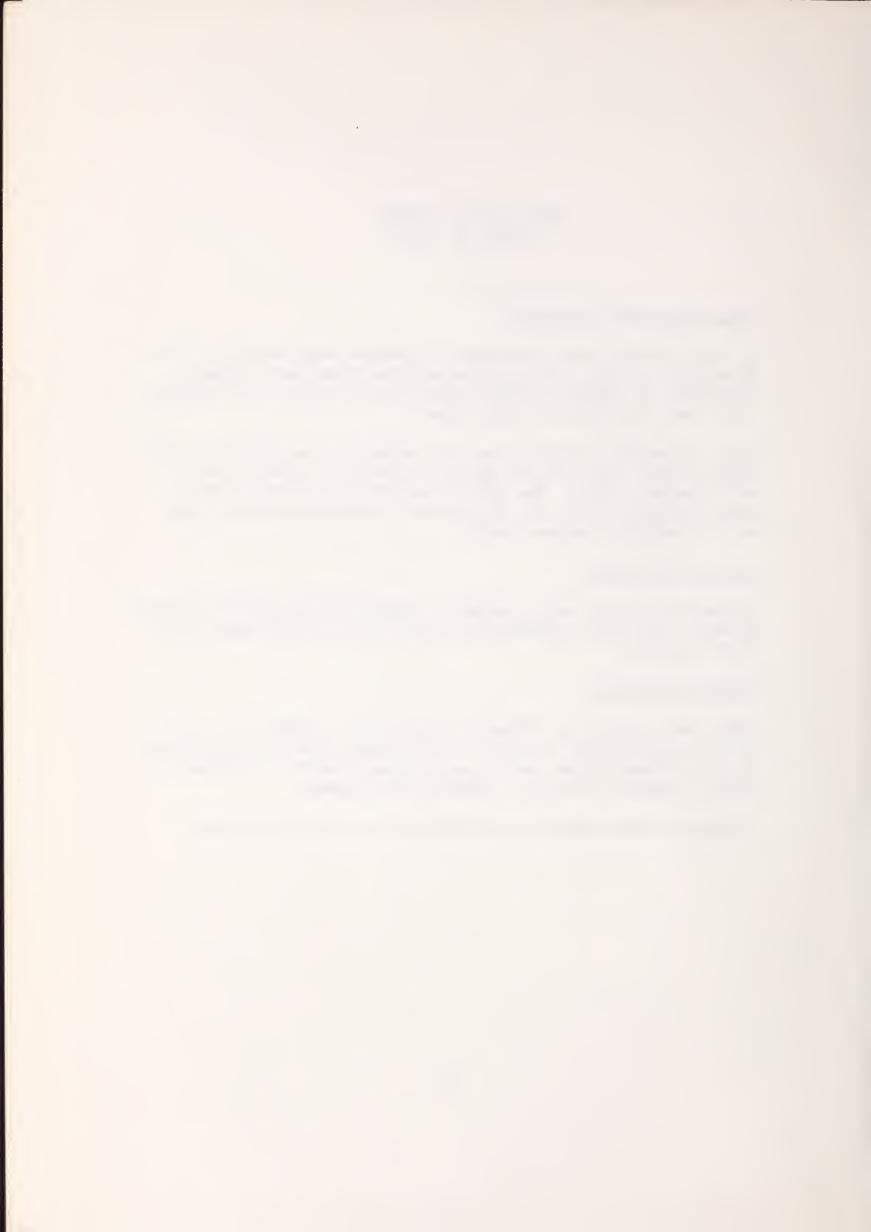
Fall Soil Moisture

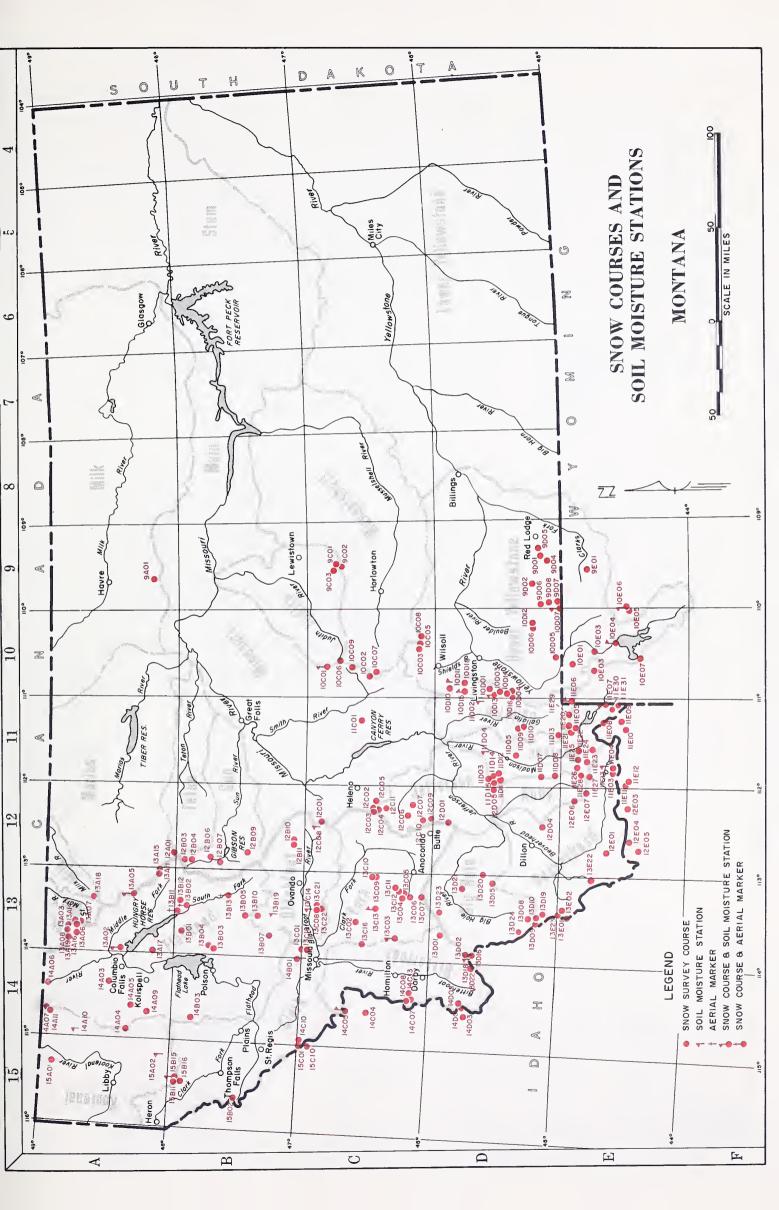
All mountain soils have average to above average stored moisture. In many areas snow accumulation will occur on soils near or at field capacity.

Reservoir Storage

Carryover storage in irrigation reservoirs is generally near or above average. One exception is the Camas Reservoir group west of the Flathead River, where good spring runoff is necessary to insure adequate irrigation supplies next summer.

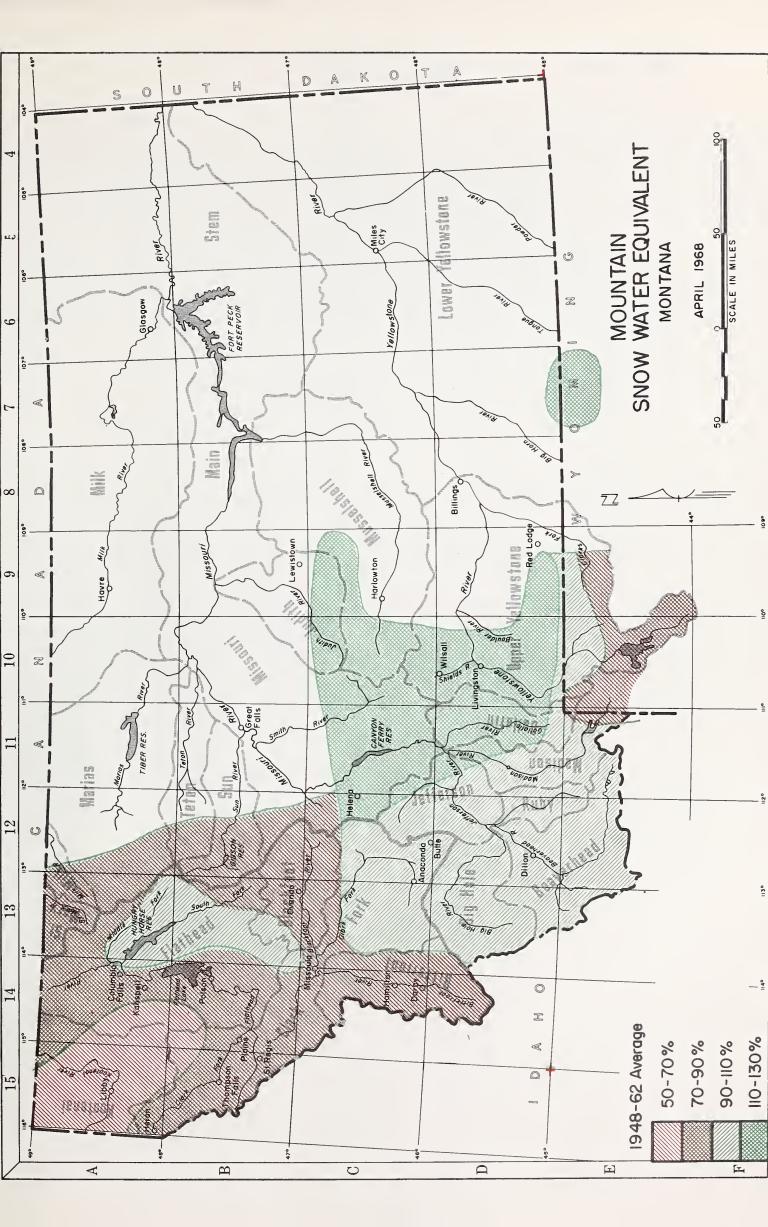
Storage in larger multipurpose reservoirs is above average.



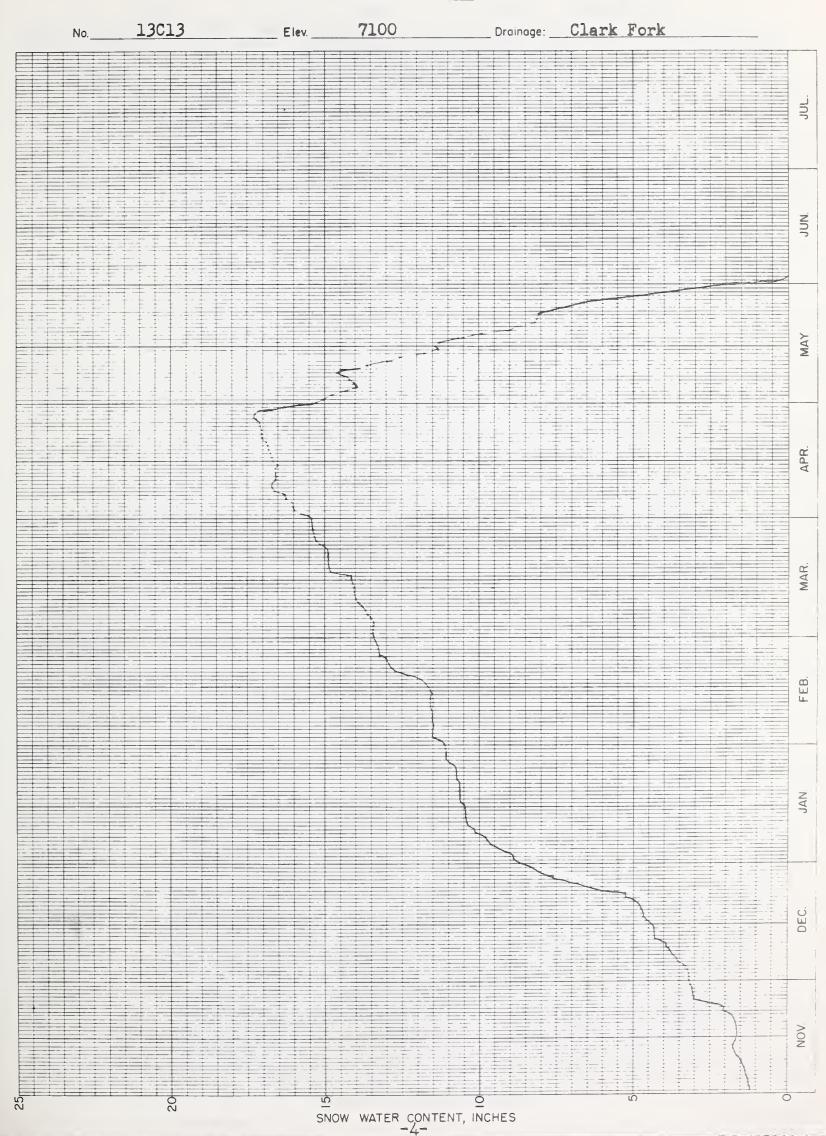


INDEX to MONTANA SNOW COURSES and SOIL MOISTURE STATIONS

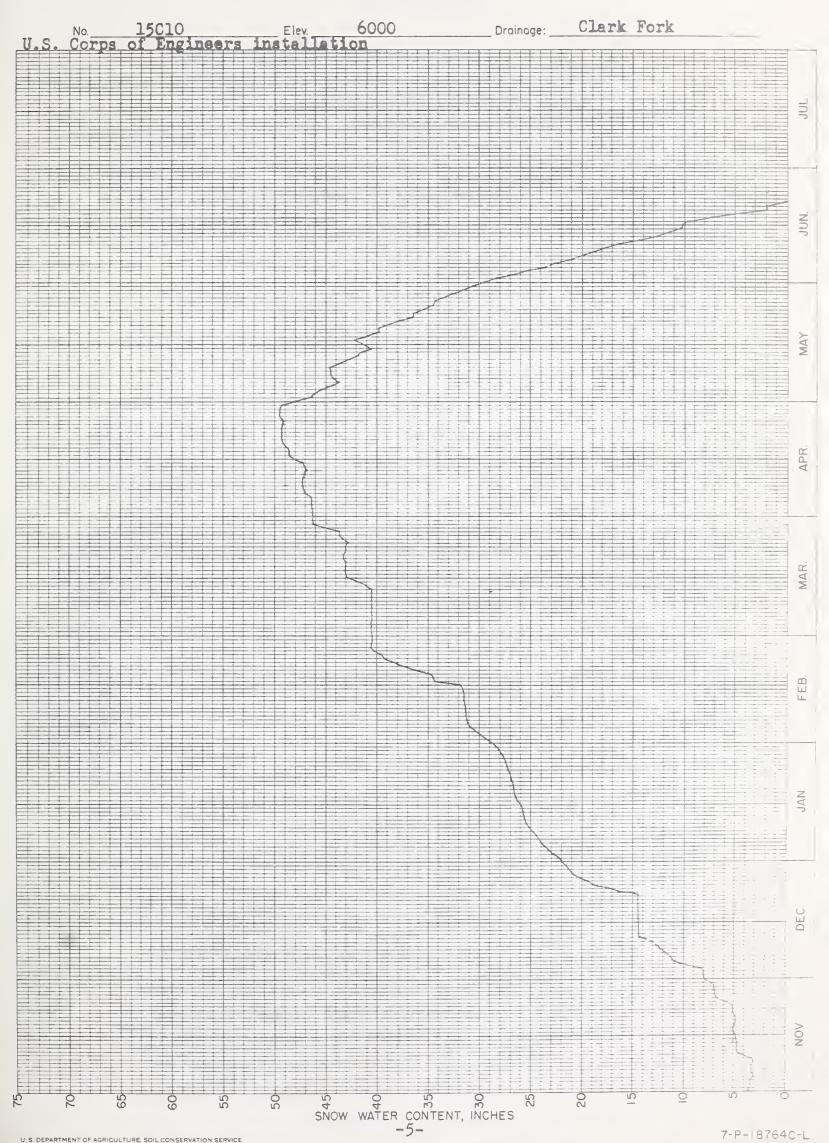
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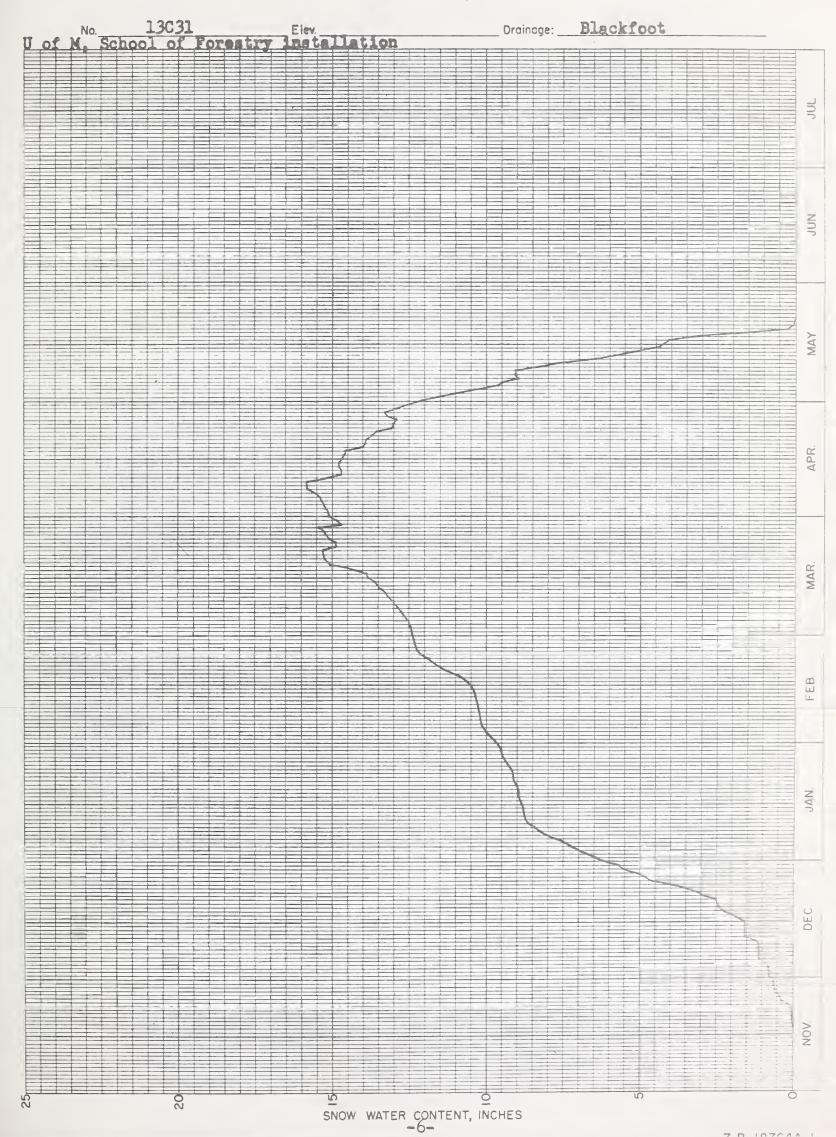












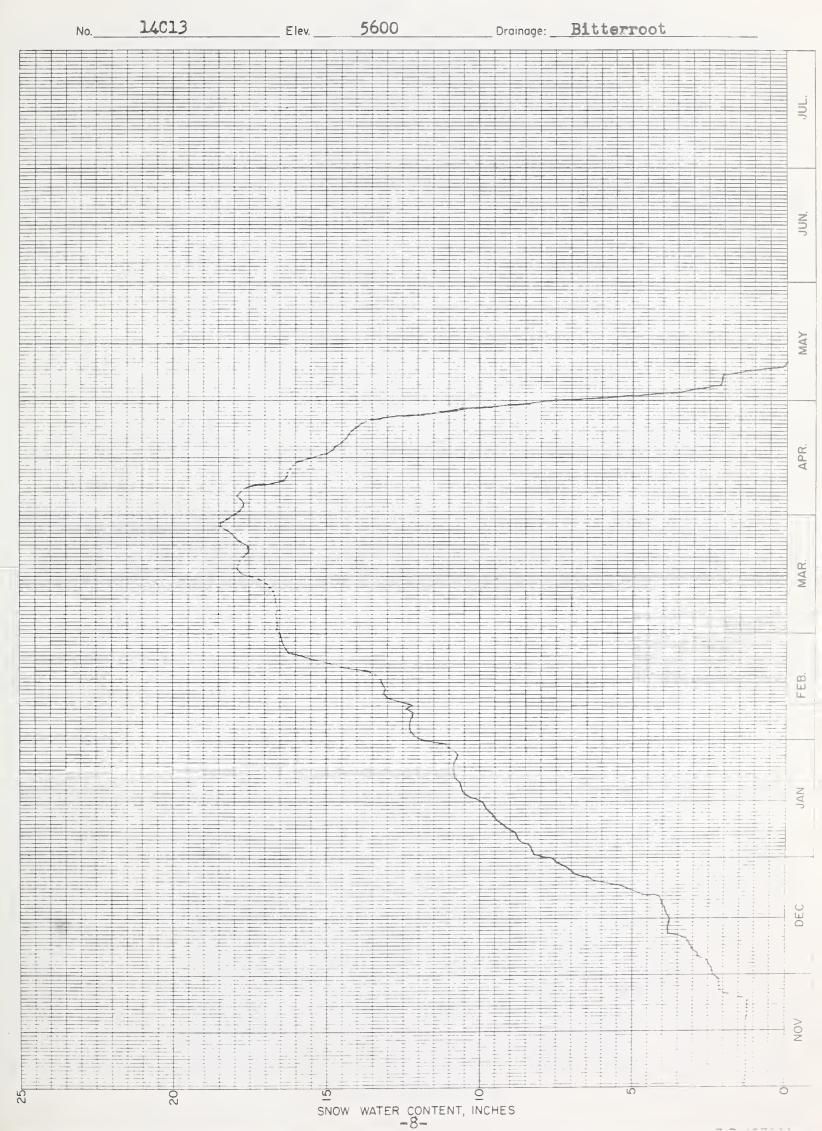


13D22 Bitterroot SNOW WATER CONTENT, INCHES

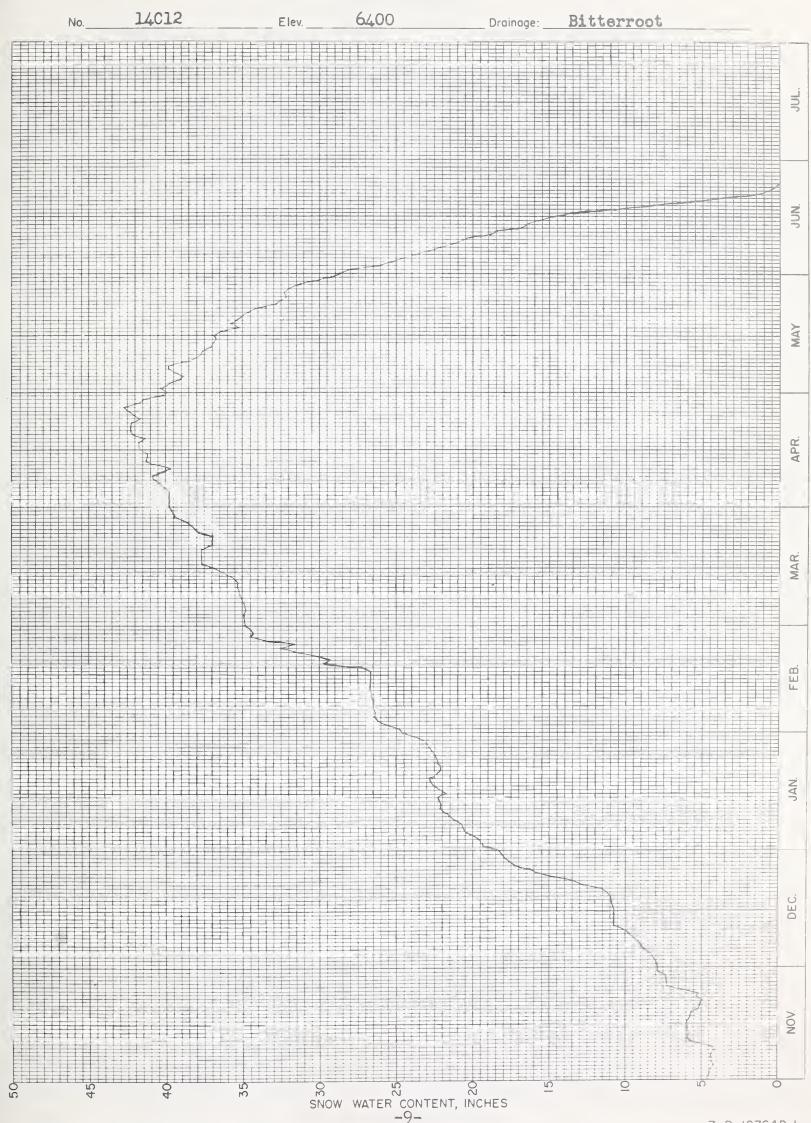


SNOW PILLOW DATA WATER YEAR 1968

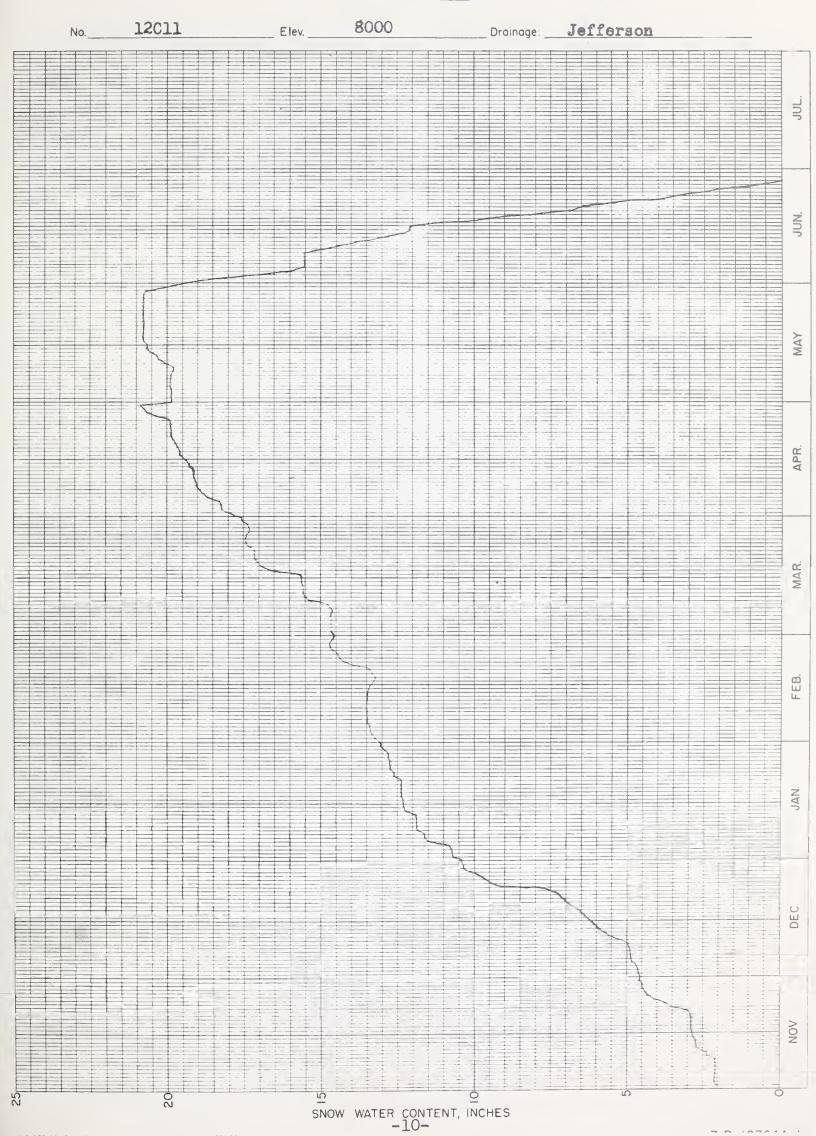
TWELVEMILE CREEK



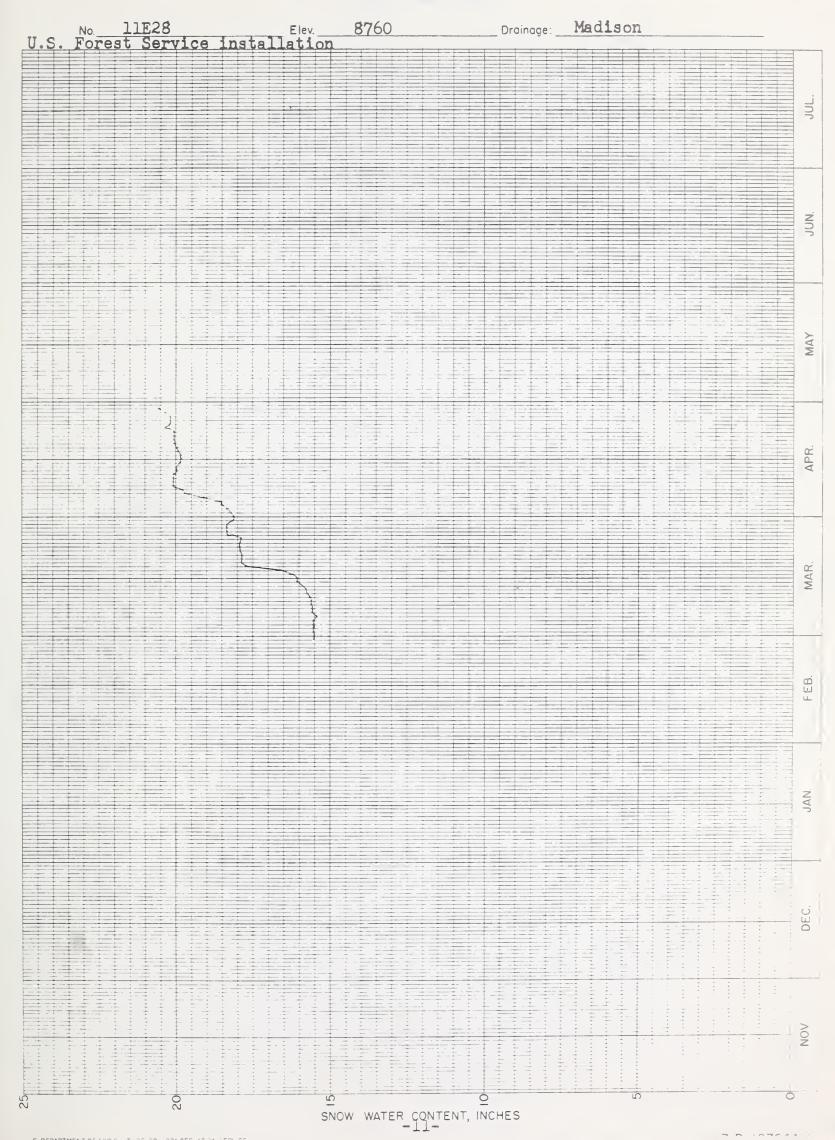




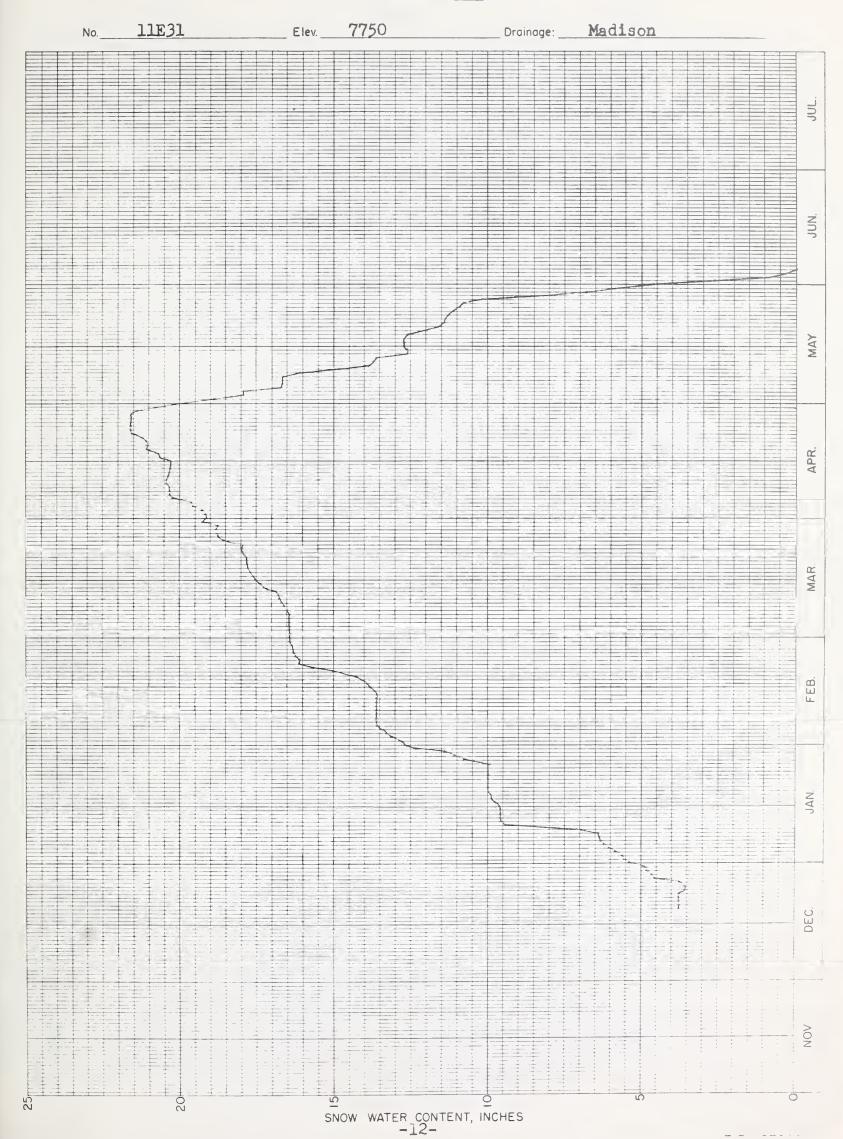








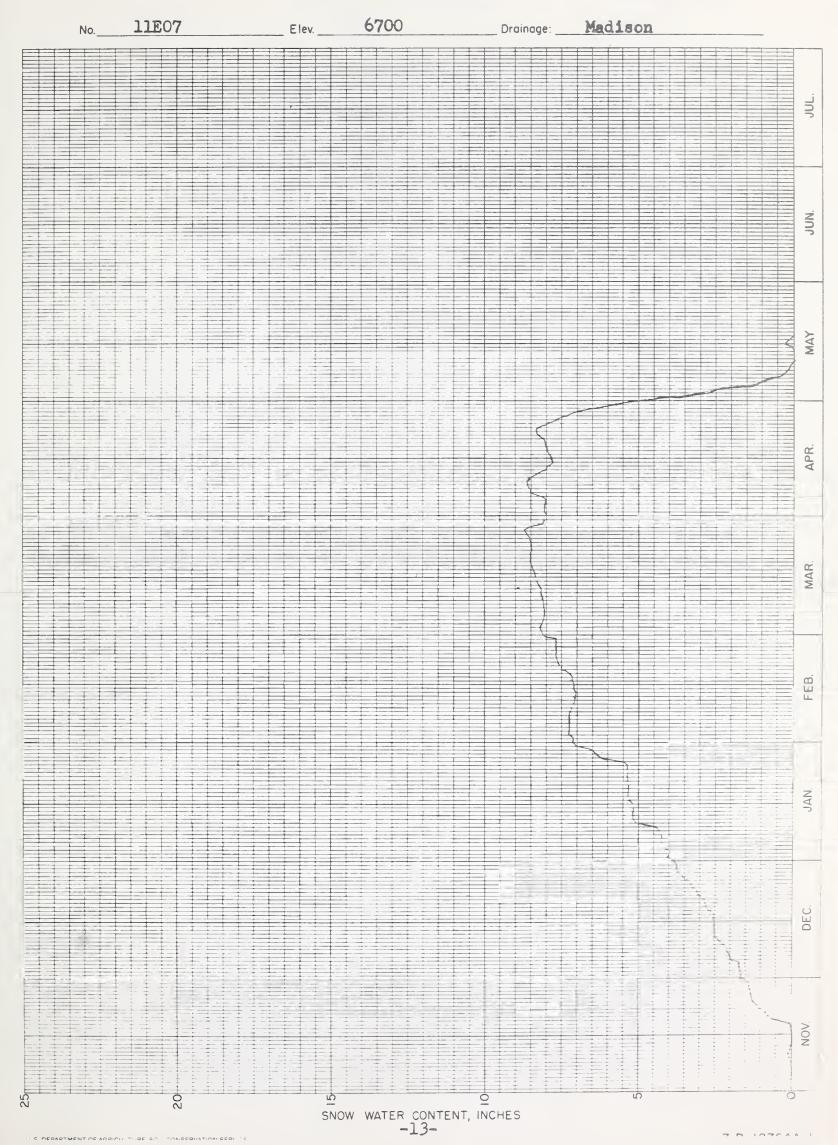






SNOW PILLOW DATA WATER YEAR 1968

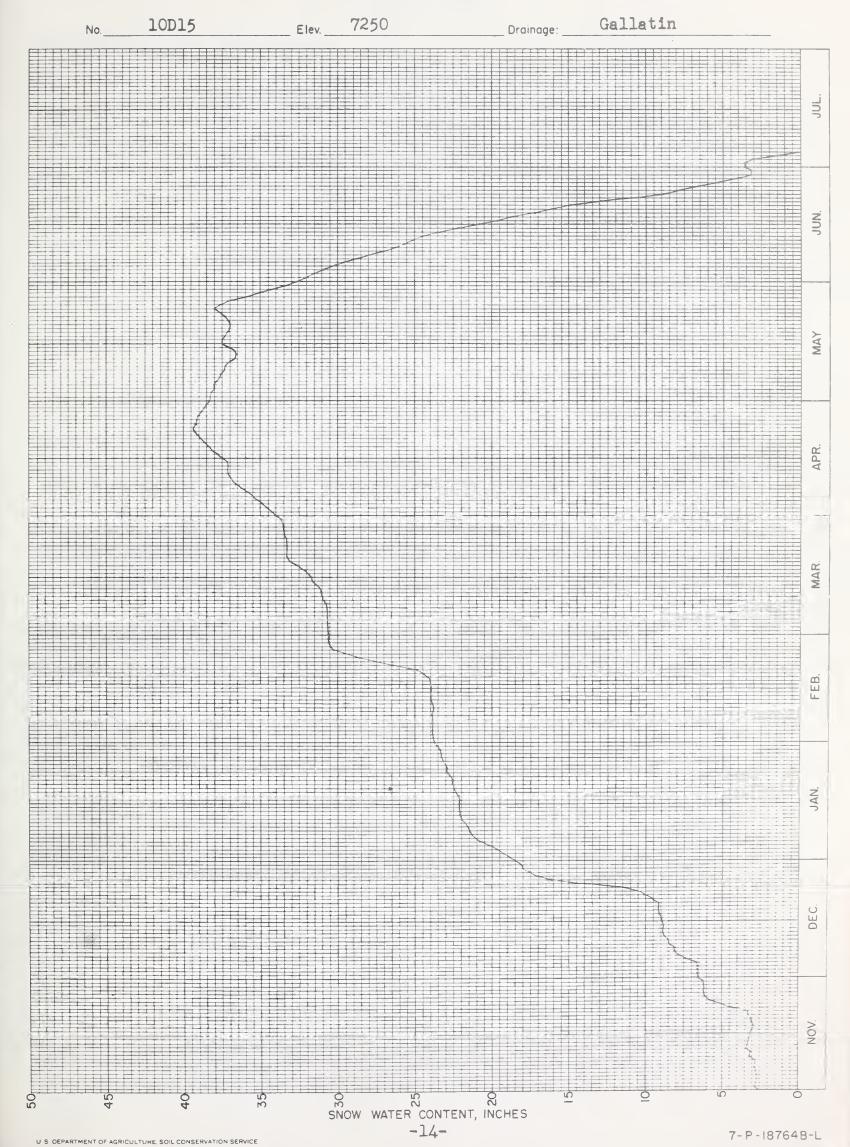
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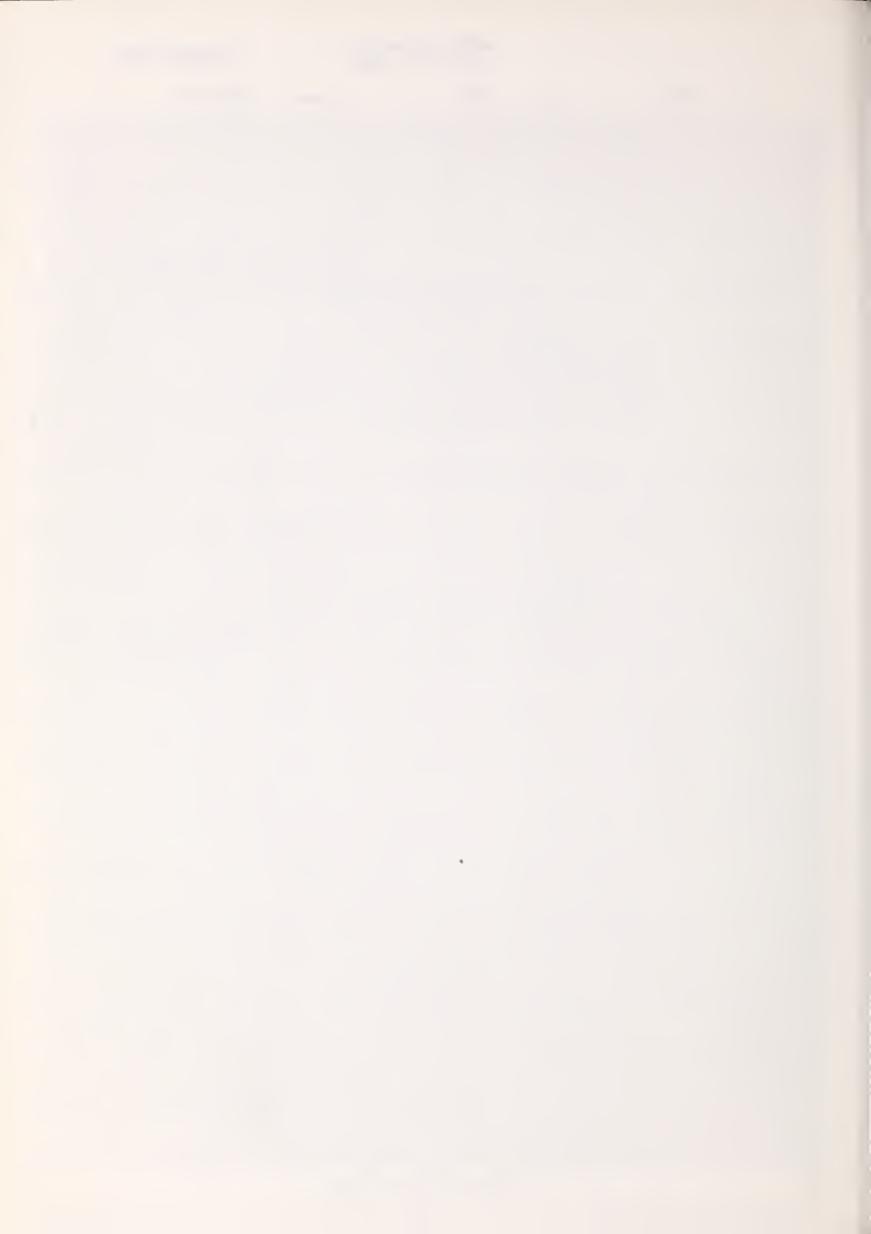


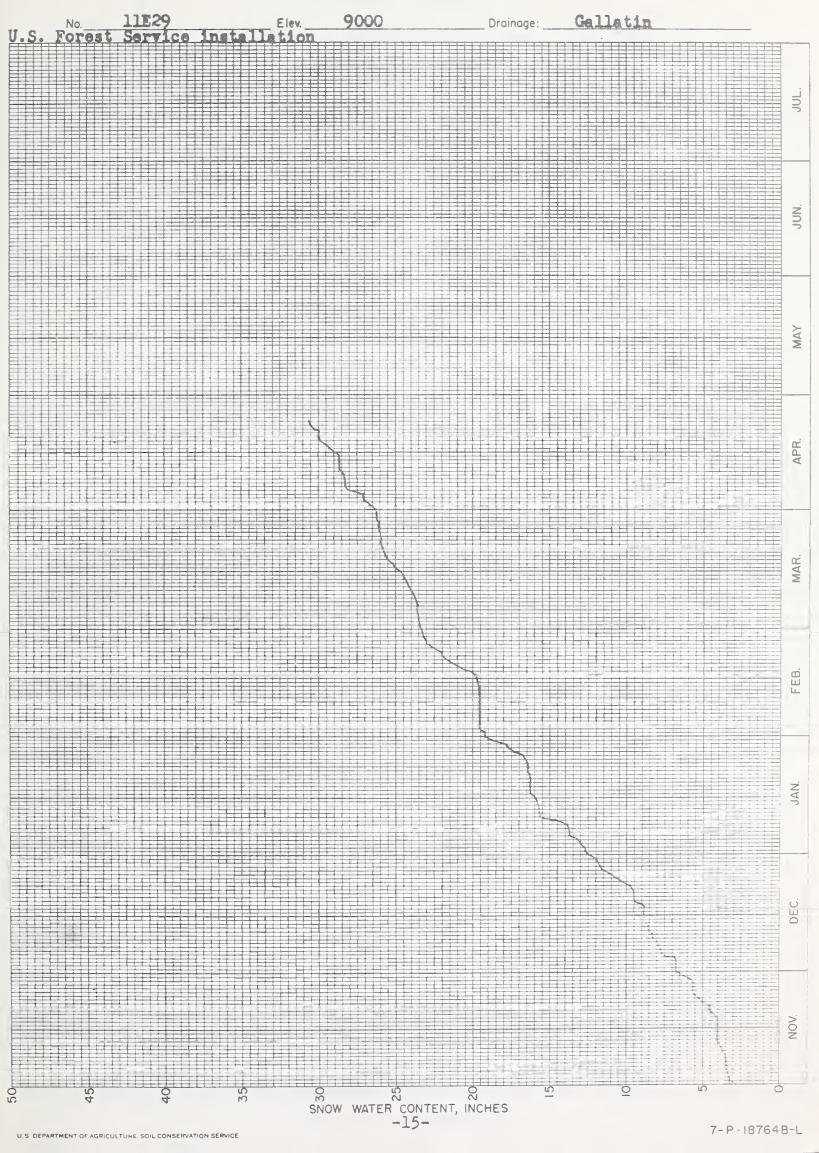


SNOW PILLOW DATA WATER YEAR 1968

BRIDGER BOWL







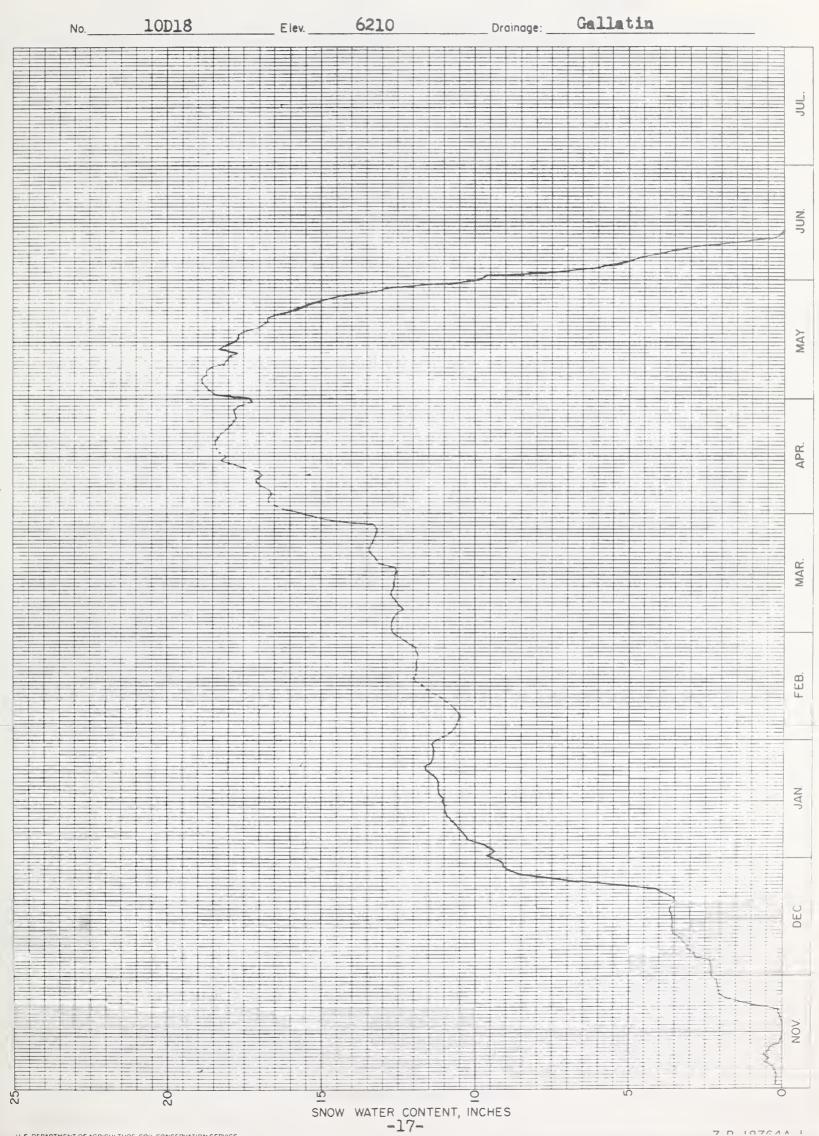


SNOW PILLOW DATA WATER YEAR 1968

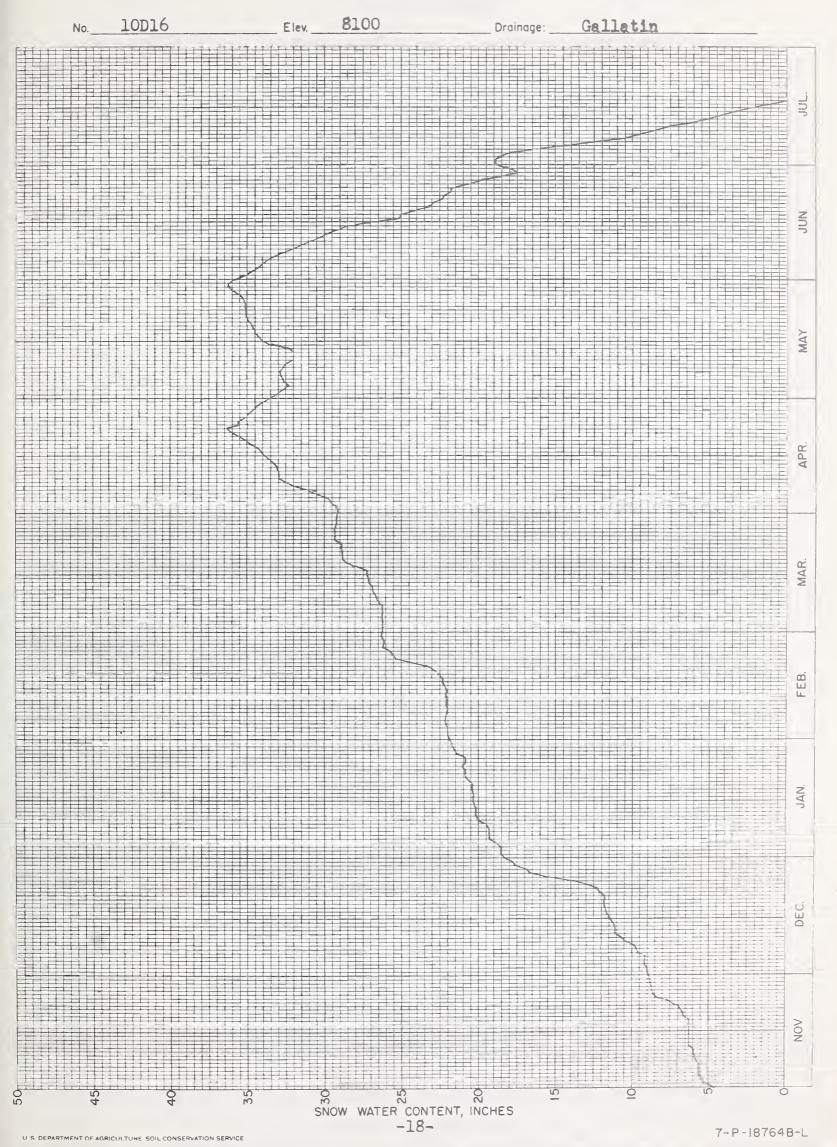
No. 10D13 Drainage: Gallatin 6860 Elev._ SNOW WATER CONTENT, INCHES -16-



SNOW PILLOW DATA WATER YEAR 1968









10009 6450 Jefferson Elev. Drainage: _ No. JUL. MAYMAR SNOW WATER CONTENT, INCHES -19-

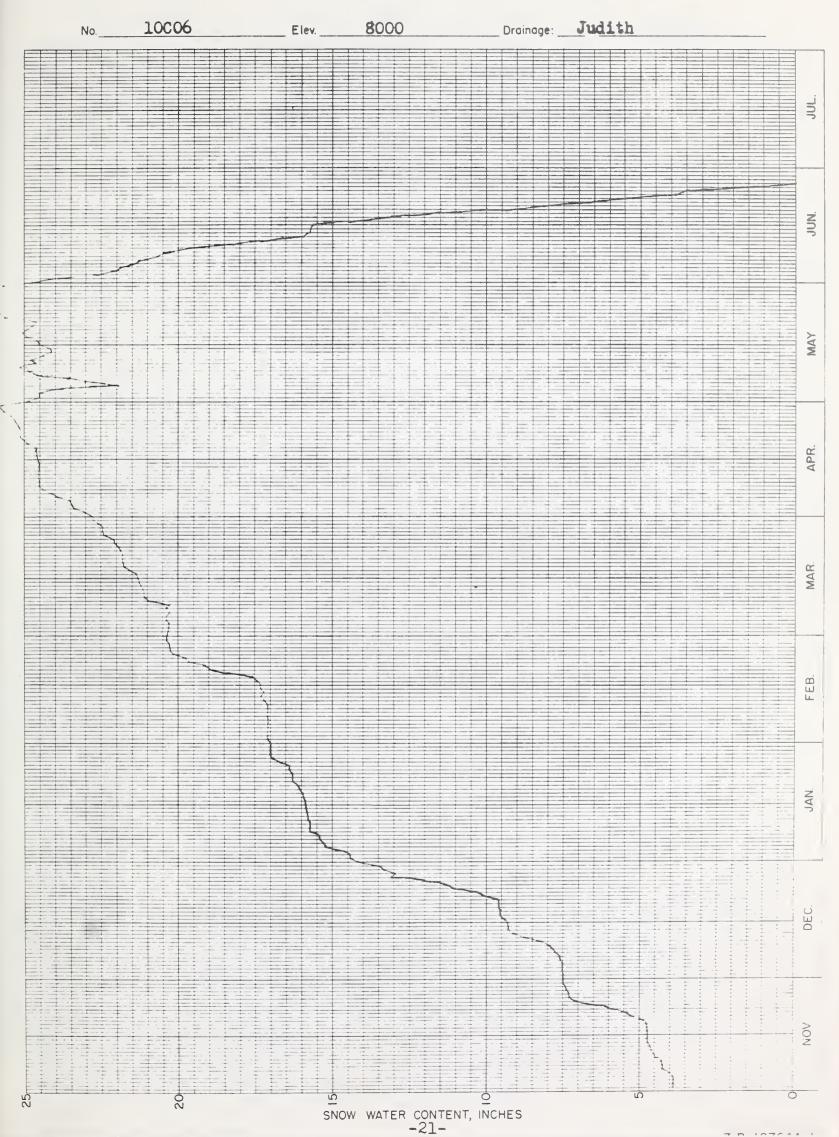


9401 4700 Drainage: Milk No._ Elev. JUN 0 JAN DEC. NOV SNOW WATER CONTENT, INCHES -20-

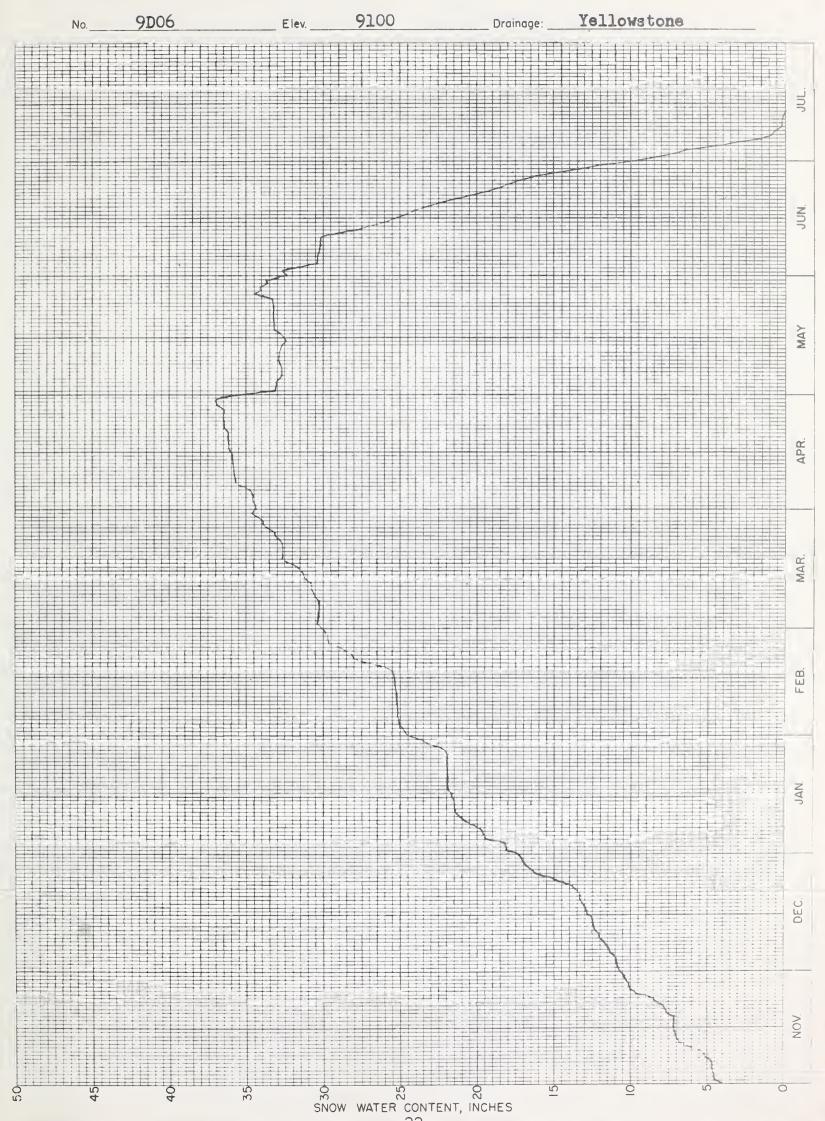


SNOW PILLOW DATA WATER YEAR 1968

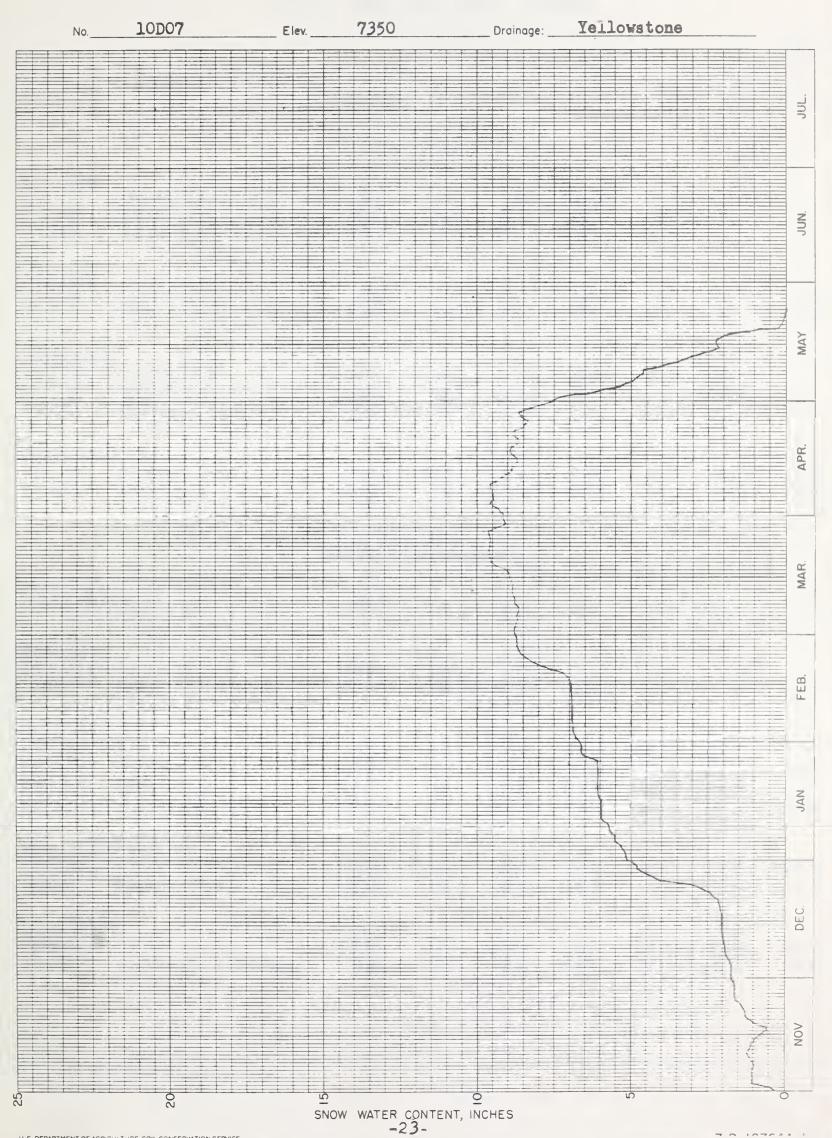
SPUR PARK









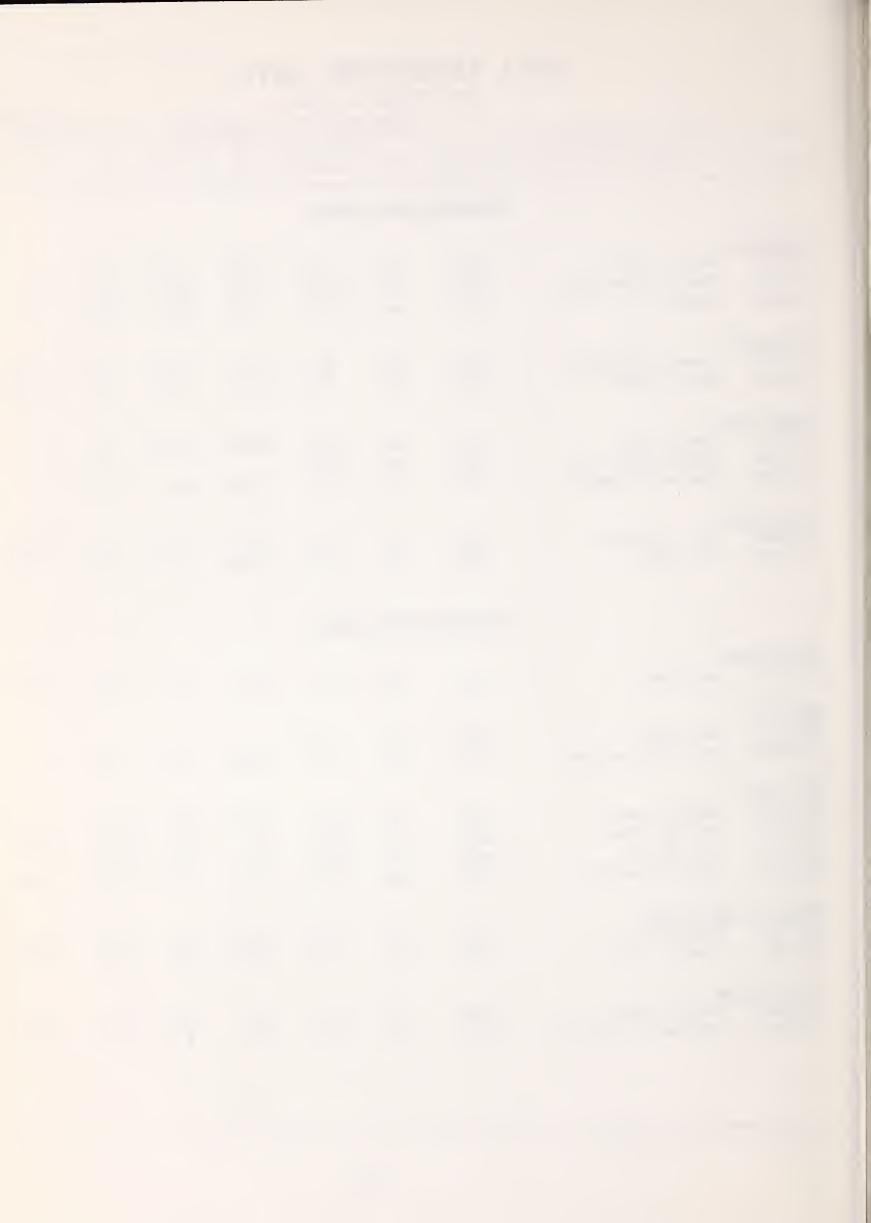




AS OF JULY 1, 1968

(Inches) SOIL PROFILE PAST RECORD CURRENT DATA DATE SOIL MOISTURE STATION FIELD SOIL LAST **AVERAGE DEPTH 0F CAPACITY MOISTURE YEAR SURVEY NO. NAME ELEVATION COLUMBIA RIVER BASIN Kootenai 7/10 15B15M Baree Trail 3800 48 7.5 5.5 4.5 7/514AlOM Murphy Lake R.S. 3000 48 22.6 21.0 19.0 7/10 20.8 15A02M Raven R.S. 3050 48 23.0 18.7 Flathead 8.2 7/1 9.2 Desert Mountain 5600 54 8.4 7.9 13A02M 5250 54 6.5 7/1 5.4 5.7 5.2 13A05M Marias Pass Clark Fork 6/28 8.7 13C13M Black Pine 7100 48 10.0 8.8 9.1 Seeley Lake R.S. 4030 48 11.9 13B19M 6/30 10.4 Skalkaho Summit 7260 48 10.8 10.2 13CO3M Bitterroot 7/3 6.4 13D18M Gibbons Pass 7100 48 7.1 6.6 6.3 5250 48 10.6 6/28 9.3 9.6 9.7 14C05M Lolo Pass MISSOURI RIVER BASIN Beaverhead 14.2 llE13M 6700 48 15.3 7/8 7.5 13.5 Lakeview Madison 11D04M Red Bluff 4800 40 4.7 6/28 2.6 3.6 11E07M West Yellowstone 6700 48 6.5 Gallatin 7/12 16.8 15.1 7250 48 17.0 10D15M Bridger Bowl 14.8 16.1 4856 54 14.5 7/1 10.9 11D02M College Site 18.6 48 18.8 7/318.1 10D13M Lick Creek 6860 6/29 8.5 11E06M Twenty-One Mile 7150 48 10.0 7.9 9.4 Missouri Main Stem 6/28 10.6 10.8 10.8 10COlM Kings Hill 7420 48 11.8 6/26 4.8 5.1 12C08M 4.6 Stemple Pass 6350 48 5.9 Yellowstone 14.7 15.3 16.5 17.6 7/1 48 10D11M Battle Ridge 6020 7/1 8.8 10.4 9.2 10D07M 48 9.4 7350 Northeast Entrance

^{**}AVERAGE FOR PERIOD OF RECORD

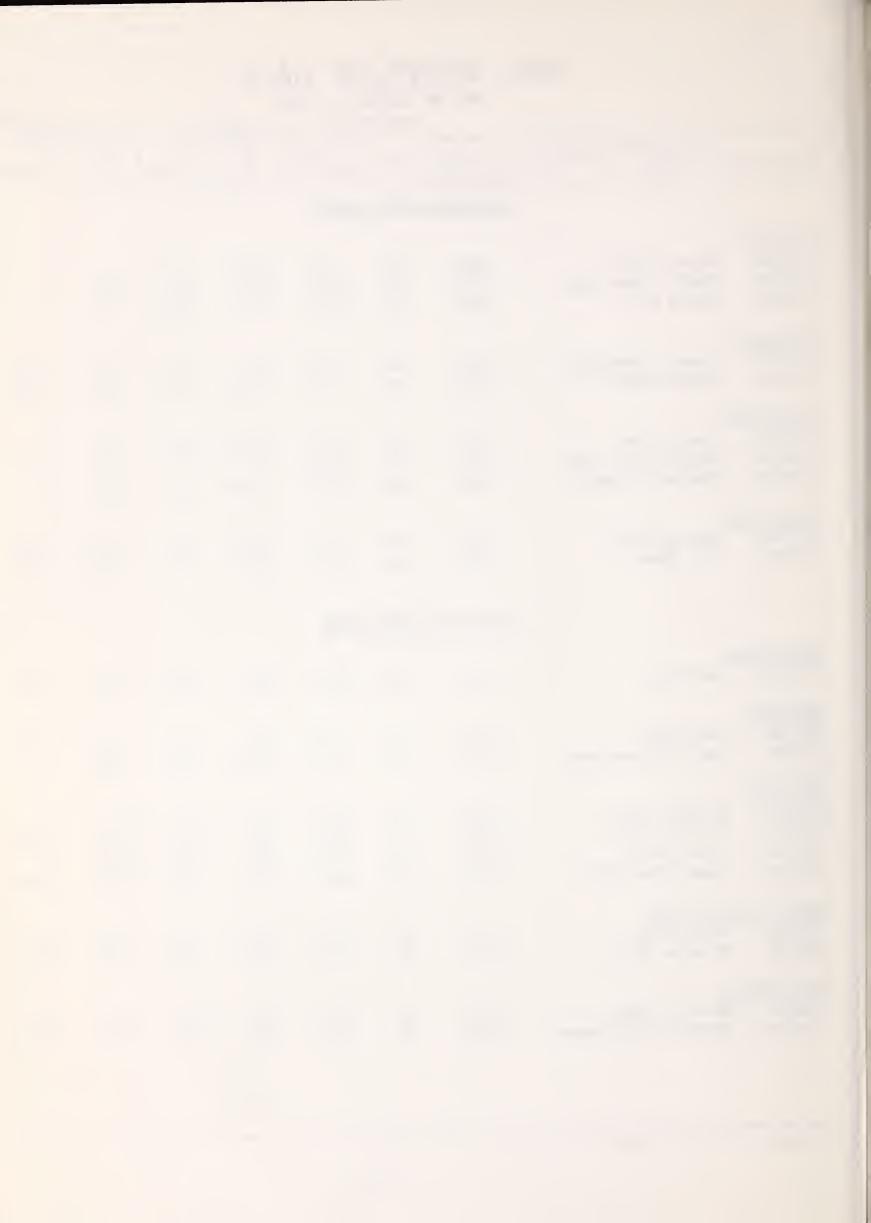


AS OF AUGUST 1, 1968

(Inches)

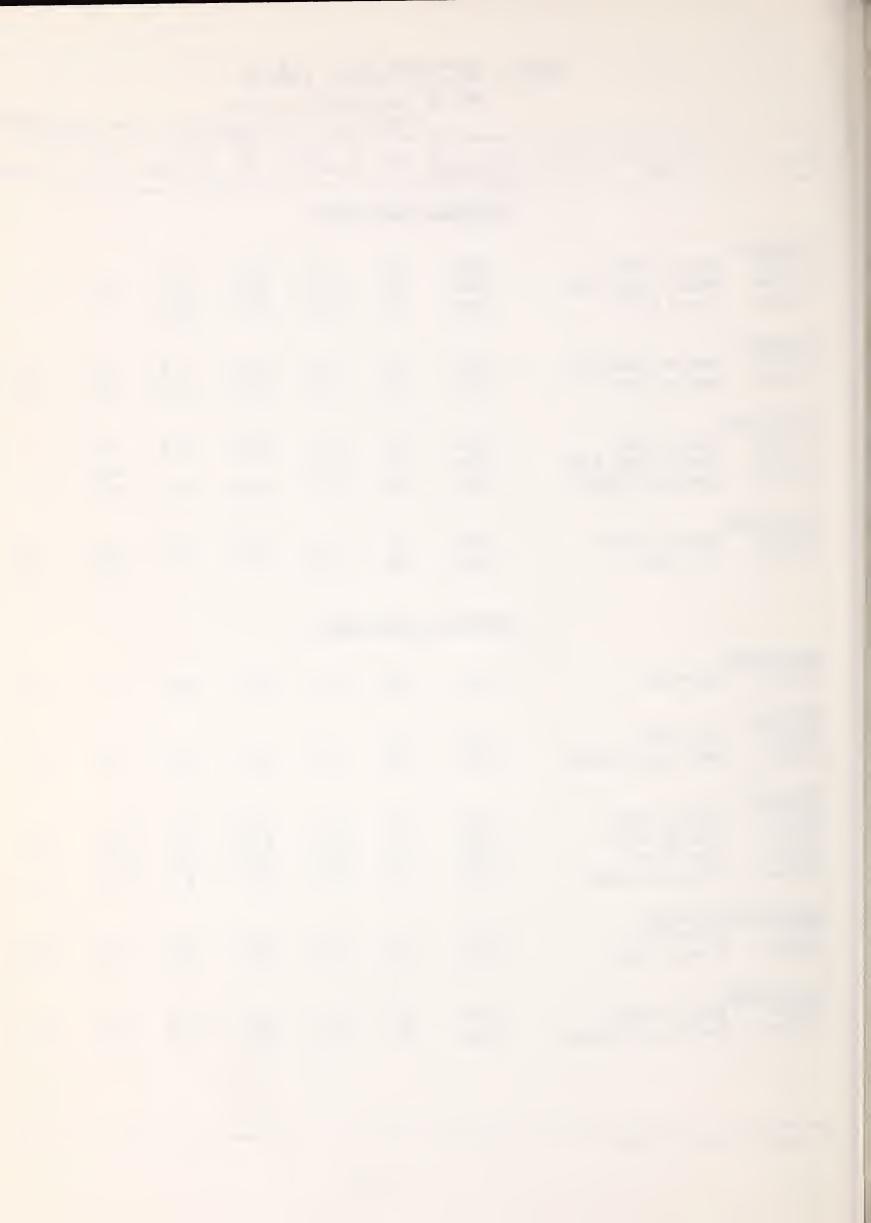
SOIL PROFILE CURRENT DATA PAST RECORD SOIL MOISTURE STATION DATE FIELD SOIL LAST **AVERAGE DEPTH OF MOISTURE CAPACITY YEAR NAME ELEVATION NO. SURVEY COLUMBIA RIVER BASIN Kootenai 15B15M Baree Trail 3800 48 7.5 8/11 3.3 48 8/1 18.5 18.5 14AlOM Murphy Lake R.S. 3000 22.6 15A02M Raven R.S. 3050 48 23.0 8/1 16.8 Flathead 54 8/1 6.4 13A02M Desert Mountain 5600 8.4 6.2 6.2 7/31 4.1 13A05M Marias Pass 5250 54 6.5 3.4 3.8 Clark Fork 7/228.6 13C13M Black Pine 7100 48 10.0 8.7 48 13B19M Seeley Lake R.S. 4030 11.9 Skalkaho Summit 7260 48 10.8 7/2210.5 10.6 13CO3M Bitterroot 7/29 Gibbons Pass 48 13D18M 7100 7.1 4.3 4.6 4.6 8/1 5.4 5.5 6.1 14C05M Lolo Pass 48 10.6 5250 MISSOURI RIVER BASIN Beaverhead llE13M 6700 48 15.3 8/7 7.5 9.6 9.1 Lakeview Madison 1.2 11D04M 8/1 Red Bluff 4800 40 4.7 1.3 1.4 6700 7/30 2.8 llE07M West Yellowstone 48 1.9 6.5 Gallatin 15.1 17.0 8/3 15.6 10D15M Bridger Bowl 7250 48 8/2 9.4 7.9 College Site 4856 54 14.5 10.2 11D02M 48 8/6 11.6 17.2 10D13M 6860 18.8 Lick Creek 7150 7/30 4.2 7.9 5.3 llE06M Twenty-One Mile 48 10.0 Missouri Main Stem 7/26 9.1 8.8 locolm Kings Hill 7420 48 11.8 9.4 12C08M 8/5 3.1 3.2 4.3 Stemple Pass 6350 48 5.9 Yellowstone 12.4 10.9 10D11M 6020 48 17.6 8/2 11.7 Battle Ridge 7.2 6.8 6.9 10D07M Northeast Entrance 7350 48 9.4 8/1

^{**}AVERAGE FOR PERIOD OF RECORD



AS OF SEPTEMBER 1, 1968 (Inches) CURRENT DATA PAST RECORD SOIL PROFILE SOIL MOISTURE STATION DATE FIELD CAPACITY SOIL LAST * * AVERAGE DEPTH MOISTURE YEAR NAME ELEVATION NO. SURVEY COLUMBIA RIVER BASIN Kootenai 9/4 3800 48 15B15M Baree Trail 7.5 5.5 3000 48 9/3 14AlOM Murphy Lake R.S. 22.6 19.3 17.8 3050 23.0 9/4 18.0 Raven R.S. 15A02M 48 Flathead 54 8/30 5.0 13A02M Desert Mountain 5600 7.8 4.8 8.4 9/1 54 6.5 4.0 2.8 3.5 13A05M Marias Pass 5250 Clark Fork 13C13M Black Pine 7100 48 10.0 8/26 8.8 7.8 13B19M Seeley Lake R.S. 4030 48 11.9 4.4 8/26 13CO3M Skalkaho Summit 7260 48 10.8 10.5 9.2 Bitterroot 7100 48 7.1 8/27 5.0 2.9 4.5 13D18M Gibbons Pass 14C05M Lolo Pass 5250 48 10.6 4.1 4.6 MISSOURI RIVER BASIN Beaverhead 8.2 6.6 6700 48 9/3 11E13M Lakeview 15.3 Madison 4.7 11D04M Red Bluff 4800 40 1.9 6700 9/1 3.1 11EO7M West Yellowstone 48 6.5 Gallatin 48 8/30 16.6 15.1 7250 17.0 10D15M Bridger Bowl 8/30 8.6 11D02M College Site 4856 54 14.5 9.7 7.2 8/29 10D13M 6860 48 18.8 17.0 15.1 Lick Creek 9/1 2.9 11E06M Twenty-One Mile 7150 48 10.0 8.0 4.0 Missouri Main Stem 8/30 6.5 8.1 10COlM Kings Hill 7420 48 11.8 9.0 9/2 2.6 4.2 12C08M 6350 48 5.9 3.6 Stemple Pass Yellowstone 8/30 10D11M Battle Ridge 6020 48 17.6 13.5 8.4 9.1 9.3 4.1 10D07M Northeast Entrance 7350 48 9.4 9/4 5.4

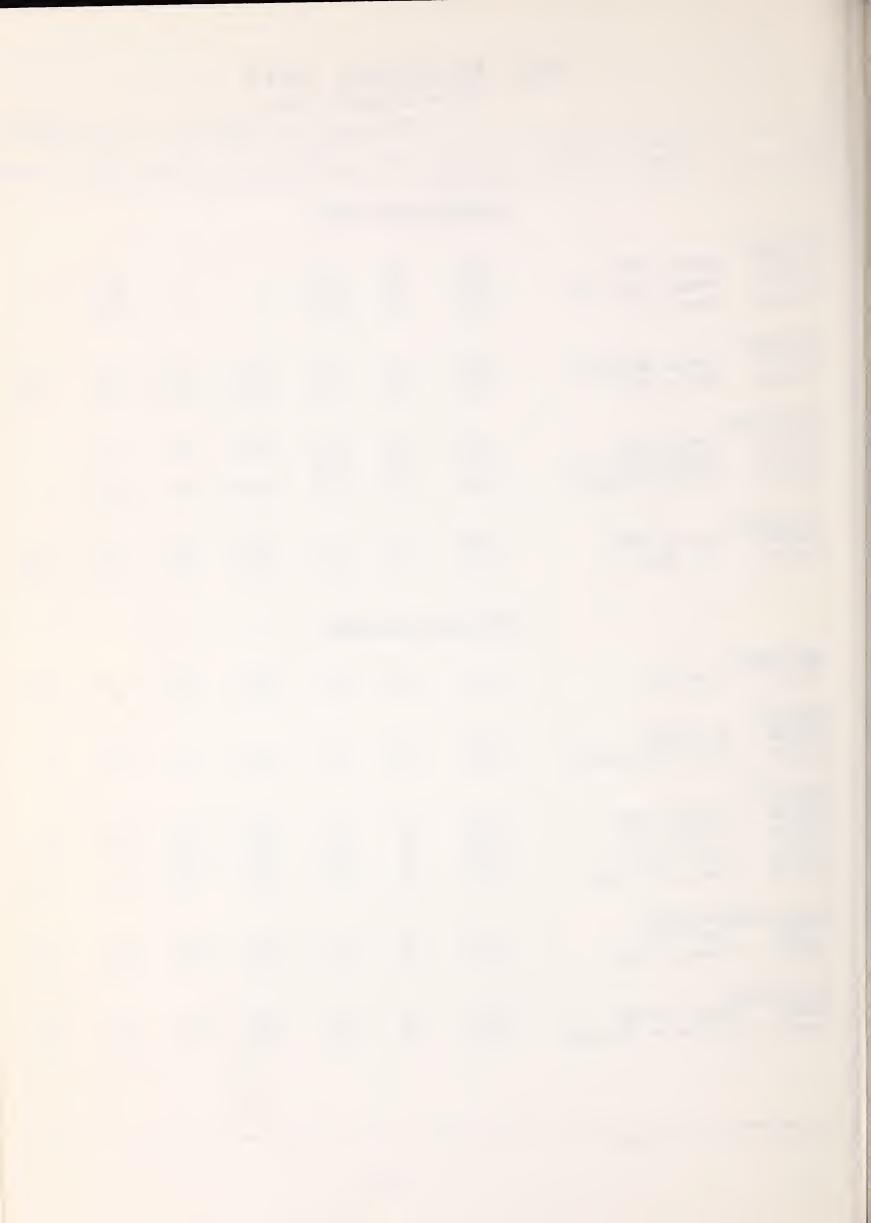
^{**}AVERAGE FOR PERIOD OF RECORD



AS OF OCTOBER 1, 1968

(Inches) SOIL PROFILE CURRENT DATA PAST RECORD SOIL MOISTURE STATION DATE FIELD SOIL LAST **AVERAGE DEPTH 0F MOISTURE CAPACITY YEAR NAME ELEVATION NO. SURVEY COLUMBIA RIVER BASIN Kootenai 48 15B15M Baree Trail 3800 7.5 4.6 22.6 18.3 3000 48 14AlOM Murphy Lake R.S. 18.0 48 23.0 15A02M Raven R.S. 3050 Flathead 9/30 8.8 6.0 Desert Mountain 5600 54 5.5 13A02M 8.4 6.4 2.5 Marias Pass 5250 54 6.5 10/1 3.7 13A05M Clark Fork 7100 48 10.0 9/26 7.4 13C13M Black Pine 8.5 Seeley Lake R.S. 4030 48 11.9 13B19M Skalkaho Summit 7260 48 10.8 9/26 10.7 10.3 13CO3M Bitterroot 9/30 7100 48 7.1 6.5 2.3 4.7 13D18M Gibbons Pass 14C05M Lolo Pass 5250 48 10.6 10/2 7.1 3.1 5.0 MISSOURI RIVER BASIN Beaverhead 6700 10/1 6.1 4.8 5.8 11E13M 48 15.3 Lakeview Madison 11D04M Red Bluff 4800 40 4.7 1.9 9/28 11EO7M West Yellowstone 6700 48 6.5 3.4 1.8 Gallatin 48 10/3 16.6 15.1 Bridger Bowl 7250 17.0 10D15M 9/29 11D02M College Site 4856 54 14.5 9.3 7.9 7.4 6860 48 18.8 9/30 17.9 10D13M Lick Creek 3.1 11E06M Twenty-One Mile 7150 48 10.0 9/28 7.8 2.5 Missouri Main Stem Kings Hill 9/27 5.2 7.5 10COlM 7420 48 11.8 10.0 9/30 5.0 1.9 3.7 12C08M Stemple Pass 6350 48 5.9 Yellowstone 9.9 10/3 13.8 9.4 17.6 Battle Ridge 6020 48 10D11M 3.7 6.3 10/2 9.4 10D07M Northeast Entrance 48 9.4 7350

^{**}AVERAGE FOR PERIOD OF RECORD



RESERVOIR STORAGE DATA

AS OF SEPTEMBER 30, 1968

	A3 01		JO 9 1700		(1000 Acre Feet)	
				USEABLE STORAG	SEABLE STORAGE	
BASIN	RESERVOIR	USEABLE CAPACITY	THIS YEAR	LAST YEAR	AVERAGE	
COLUMBIA RIVER BASIN						
Flathead	Hungry Horse Flathead Lake Camas (Sum of 4) Mission Valley (Sum of 8)	3,428.0 1,791.0 45.2 100.3	3,428.0 1,785.0 11.4 85.3	3,196.0 1,772.0 20.9 6.9	3,392.9** 1,683.3 29.2 17.0	
Clark Fork	Georgetown Lake Noxon Rapids	31.0 334.6	30.4 331.4	28.7	26.5	
Bitterroot	Como Painted Rocks	34.9 31.7	5.8 31.5		2.9 27.2	
MISSOURI RIVER BASIN						
Beaverhead	Clark Canyon Lima	328 ₄ 9 84 ₄ 0	140.2 42.1	134.1 39.4	18.5	
Ruby Madison	Ruby Hebgen Lake Ennis Lake	38.8 377.5 41.0	331.5 39.7	310.4 39.3	7.1** 262.6 37.3	
Gallatin Missouri	Middle Creek Canyon Ferry Hauser & Helena Lake Helena Holter Lake Smith River	8.0 2,043.0 61.9 10.4 81.9 10.7	5.4 1,861.0 60.7 10.0 77.2	2.7 1,709.0 60.7 10.0 79.5 5.3	2.5** 1,742.1** 58.6 9.5 74.7 3.7**	
Sun	Durand Martinsdale Deadman's Basin Fort Peck Gibson Willow Creek	7.0 23.1 72.2 19,410.0 105.0 32.3		23.4	11,308.3 39.1	
Marias	Pishkun Lower Two Medicine	32.0	18.5	7.3	20.l 4.8	
	Four Horns Swift Lake Frances Tiber	19.2 30.0 112.0 1,347.0	67.0 466.1	5.0 71.1 605.2	14.2 90.8 684.9**	
Milk	Fresno Nelson Lake Sherburne	127.2 66.8 66.1	51.0 3.3	20.9	38.8 20.3	
Yellowstone	Mystic Lake Tongue River Cooney	.20.8 68.0 27.5	40.0 18.8	26.9 13.6	20.6	
Big Horn	Yellowtail	1,356.0	829.4	1,052.0	<u>c=</u>	

NOTE: ALL AVERAGES BASED ON 1948-1962 (15 YEAR PERIOD). **AVERAGE FOR PERIOD OF RECORD



Agencies Cooperating in Collecting Data Contained in this Bulletin

- U. S. Forest Service Region 1, Missoula, Montana
- U. S. Geological Survey Helena, Montana
- U. S. Army Corps of Engineers Portland, Oregon Seattle, Washington Omaha, Nebraska
- U. S. Indian Irrigation Service St. Ignatius, Montana
- U. S. Weather Bureau Helena, Montana
- U. S. Bureau of Sports Fisheries and Wildlife Red Rock Lakes Refuge Monida, Montana
- U. S. Bureau of Reclamation Billings, Montana Boise, Idaho
- U. S. Soil Conservation Service Montana, Wyoming, Idaho
- Soil and Water Conservation Districts
 Montana Counties
- U. S. Bonneville Power Administration Portland, Oregon

- U. S. National Park Service Yellowstone National Park Glacier National Park
- Montana Power Company Butte, Montana
- State Water Conservation Board Helena, Montana
- North Montana Branch Station Agricultural Experiment Station Havre, Montana
- Montana State University
 Agricultural Experiment Station
 Bozeman, Montana
- University of Montana School of Forestry Missoula, Montana
- Johnson Flying Service, Inc. Missoula, Montana
- Water Rights Branch, Dept. of Lands and Forests Victoria, British Columbia
- Department of Northern Affairs and National Resources Calgary, Alberta

UNITED STATES DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE P. 0. Box 98

BOZEMAN, MONTANA 59715

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